

DEPARTMENT OF THE INTERIOR

HON. W. J. ROCHS, Minister; W. W. CORY, Deputy Minister.

FORESTRY BRANCH—CIRCULAR No. 7.

R. H. CAMPBELL, Director of Forestry.

MANITOBA A FOREST PROVINCE

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OTTAWA
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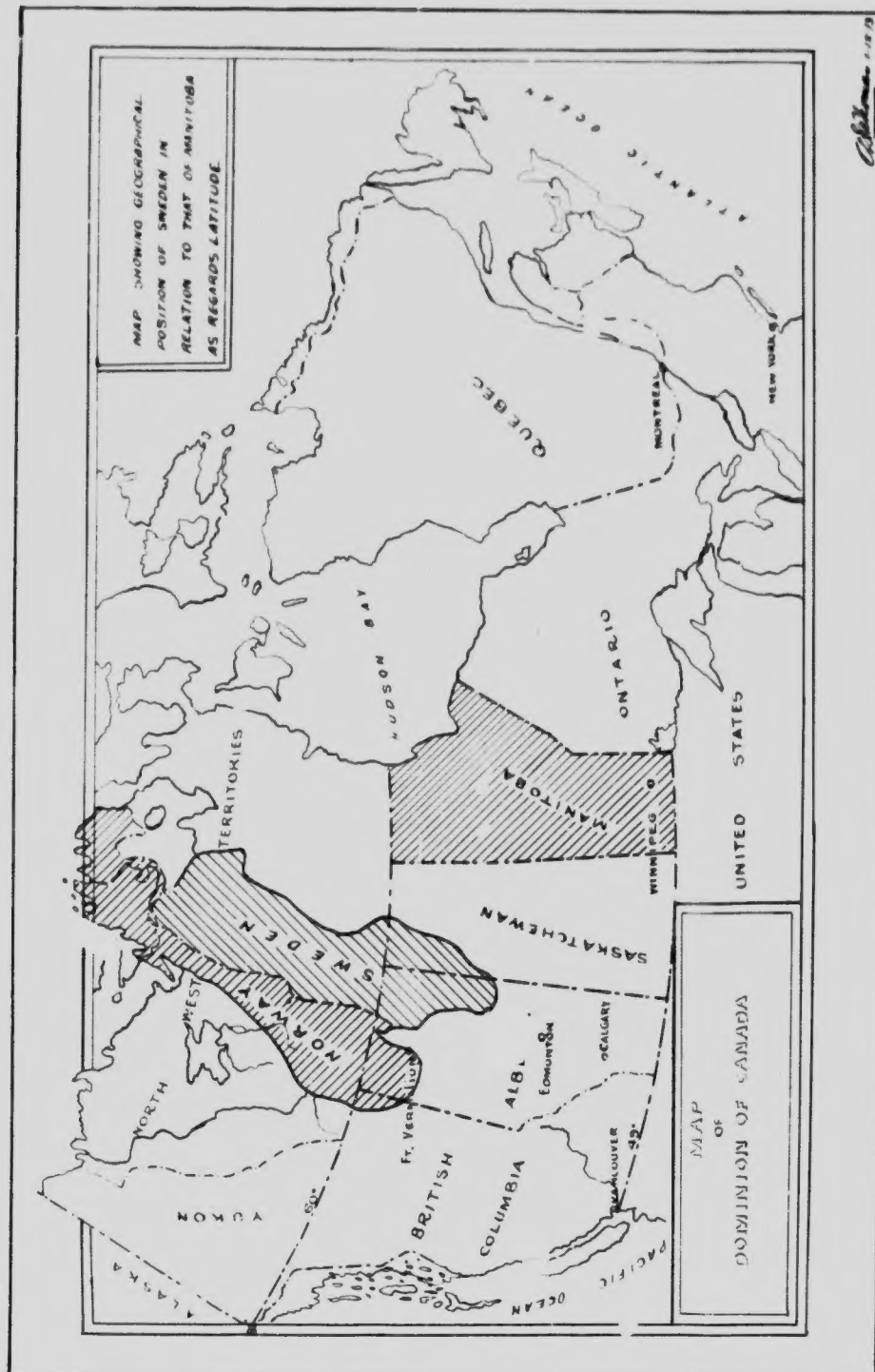
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MANITOBA---A FOREST PROVINCE.

(An Address delivered before the Canadian Forestry Association at its Convention held at Winnipeg, July 5 to 7, 1913.)

The wealth of a nation may be in the character, the ability, the energy, the resource of its people, but the material basis of wealth is found in the natural resources of the country. Without such a material basis the ability of the people has but little on which to exercise itself, and, indeed, the character of the people is demonstrated to a large degree by their use or mis-use of the natural resources. An enquiry into the extent and condition of the natural resources of the Province of Manitoba is therefore one of great interest.

Manitoba as the first producer of No. 1 hard wheat reaped a great harvest, not only of wheat, but of reputation as an agricultural province, a reputation which is thoroughly justified. The level prairies which formed the bed of the glacial Lake Agassiz and the western and northern shores stretching to Brandon and Dauphin districts form an extent of 20,000,000 acres of as good agricultural land as is to be found anywhere in the world, which last year on a cultivated area of 1,646,200 acres produced crops of \$66,274,700 value. The quantity of grain produced was 128,844,000 bushels, of which 52,874,000 bushels were wheat. It is unnecessary for me to attempt to predict the future of agriculture in this Province or give any advice in regard to it. That is properly in the hands of the agricultural authorities who are investigating and directing its development. From reconnaissance surveys made by officers of the Forestry Branch of the Department of the Interior it is possible, however, to indicate where agricultural districts may be opened up.

In southeastern Manitoba is a district of two million acres in area, most of which is covered with muskeg, but most of which would be of agricultural value if drainage works were carried out such as are in successful operation in similar territories in Minnesota immediately to the south.

In northern Manitoba, an area approximating three to four million acres on the Saskatchewan River might by drainage works be made of agricultural value. At present lake and muskeg cover most of this area.

On the line of the Hudson Bay Railway there is a large area of clay land which should be valuable for agricultural purposes. The area of such land has not been closely determined, as the examinations made were of a general nature, but the clay is of sufficient depth and the vegetation is of the same character as in more southern parts of the province, indicating that the possibilities of agricultural development are good. The more northern latitudes have longer hours of daylight in the summer, and this makes a shorter growing season necessary and brings about quicker maturity of crops. In 1910, when the investigations were made by this Department, there was no frost between 8th June and 11th September. The chief difficulty in present conditions is excess of moisture in the soil.

For the development of agriculture in such new districts in Manitoba an extensive drainage policy is necessary and investigations looking to a comprehensive scheme for this purpose are well worthy of the attention of the authorities and of all who are interested in the future of the Province.

Water is one of the greatest natural resources of the Province for power development and utilization in many ways. Fortunately the precipitation in Manitoba is generally ample for agricultural purposes, but the industrial development of the Province and the

convenience and comfort of its citizens will depend much on the quality and quantity of its water supply. There are volume and fall sufficient in the Winnipeg, Red, Saskatchewan, Nelson and other rivers to make an important water system. Large water-power development is possible in Manitoba, but such development depends largely on the regularity of stream flow, and the hydrographic investigations to determine the flow in the streams of the Province recently begun will make a wise and steady development possible. The influence of the forests on the regularity of stream flow should not be lost sight of in this connection and the forest cover of important watersheds should certainly be preserved.

More thorough exploration and prospecting may discover unexpected mineral resources, but up to the present time large bodies of mineral of economic value have not been located, and, although mineral deposits of value occur, the future of this natural resource is problematical. Coal is not found in the Province outside of the lignite deposits in the southwestern corner, so that water-power and wood or peat fuel are the native products for providing power for industries.

MANITOBA'S FOREST WEALTH.

Manitoba has not been looked on as a forest country, but it has always had a considerable area of forest, and, since the boundaries have recently been extended, a large territory has been added which is almost entirely forested land.

The forest flora of this province is varied. At the southeastern corner the white and red pines of Ontario intrude, intermingled with spruce, jack pine, tamarack, birch and poplar. Along the valley of the Red and Assiniboine rivers was a mixed forest of elm, ash, oak, basswood, and ash-leaved maple, where trees were found ranging to 24 inches in diameter. Rising like islands from the agricultural plains, tracts like the Turtle, Riding, Duck and Porcupine Mountains bore forests of oak, ash and poplar in the Turtle Mountains, and of spruce, jack pine, oak, elm, ash, poplar and ash-leaved maple in the others. The character of the virgin forest may be seen from the following extract from a report of explorations made by Professor Hind on the 8th November, 1858:

'I beg to subjoin the circumference, five feet from the ground, of a few trees within fifty yards of our camp on the Riding Mountain:—Aspen, 4 ft. 6 ins., 4 ft. 6 ins., 4 ft. 1 in., 5 ft.; White Spruce, 7 ft. 3 ins., 5 ft. 4 ins., 6 ft. 6 ins., 6 ft.; Birch, 3 ft. 6 ins., 3 ft.; Poplar, 4 ft. 9 ins., 4 ft. 6 ins. These trees represent, as far as observations permitted, the general character of the forest on the summit plateau of the Riding Mountain.'

Spruce, tamarack, jack pine and poplar are useful for lumber and for pulp. The hardwoods may be the foundation for industries of great value. A more detailed description of each species and its possible uses is attached.

THE MANITOBA FOREST RESERVES.

The forest in the southern portion of Manitoba, with the exception of wood-lots on farms, is now almost entirely confined to the Forest Reserves and a short description of these follows:—

The Turtle Mountain Forest Reserve lies along the international boundary in the western part of the Province. It comprises an area of 69,920 acres, elevated from 200 to 600 feet above the surrounding prairie and broken with lakes and sloughs which form the sources of the Pembina and Whitemud Rivers. The soil is a heavy clay, and consequently is not the most favourable for coniferous forests, but poplar, ash and oak grow naturally, and it only requires protection from fire to make this a well forested tract and one of great value to the district and the Province. Small experimental plantations of spruce and Scotch pine have been set out and are making

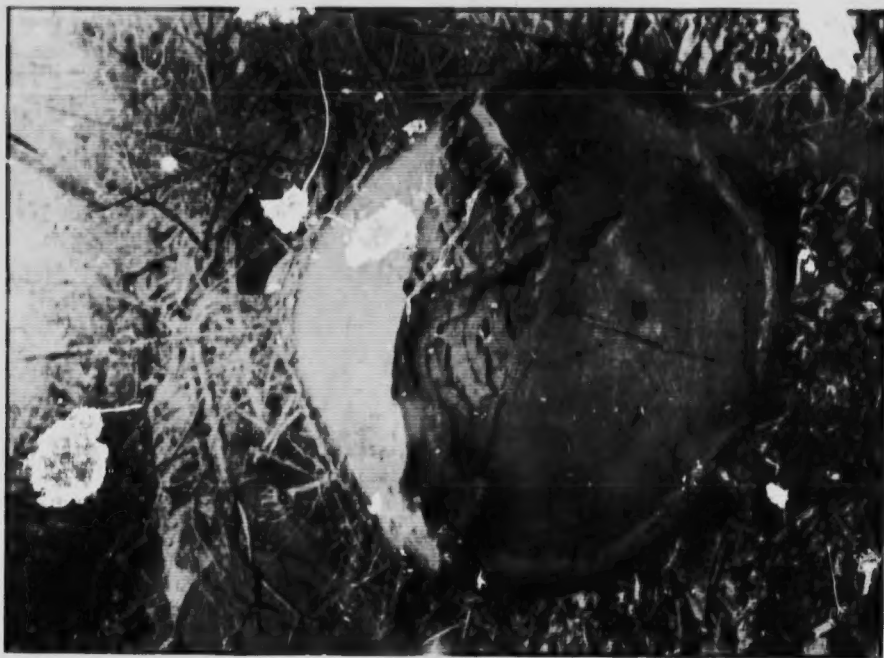


Photo. R. D. Craig.
White Spruce Log, 28 Inches in Diameter, Rolling Mountain Forest Reserve.
 This Tree Stood in Sec. 28, T. 23, R. 19, west of the Principal Meridian, on the
 east Fork of Edwards Creek, and was 92 Feet High.



Photo. N. M. Ross.
Natural Growth of Ash and Oak near Morden, Manitoba.
 The Tree on the Left of the Picture is Green Ash, that on the Right Scrub Oak.
 The Figure of a Man, Dimly Showing on the Left of the Oak, Gives an Idea of the Size
 of the Trees.

satisfactory progress. One of the best purposes served by this Reserve will be as a summer resort, and on the beautiful lakes situated in the Reserve there are already a large number of summer cottages and an appreciative summer colony.

The Spruce Woods Forest Reserve is an area of sandy land 143,680 acres in extent in townships 8 to 10, ranges 12 to 16, west of the principal meridian, part of which is traversed by a tamarack swamp. In the swamp the tamarack grows well and is reproducing satisfactorily. On the uplands a scattered growth of spruce is in places making a slow effort to reforest the dry, wind-swept prairie, while over a considerable portion there is no mature growth to furnish a seed supply and efforts at artificial seeding have been barren of results. This land is of no value except to grow a crop of trees and as an experimental plantation has shown that this method will be successful a forest nursery has been established to provide trees for reforesting. There is now provided in beds at the nursery the following stock:

1-Year-old—

Jack Pine..	50,000	
Scotch Pine..	2,000	
White Spruce..	100,000	
Total..		152,000

2-Year-old—

Lodgepole Pine..	30,000	
Bull Pine..	35,000	
Black Spruce..	5,000	
Jack Pine..	5,000	
Total..		75,000

3 Year transplants—

Jack Pine..	1,500	
Bull Pine..	1,500	
Total..		3,000
Grand total..		230,000

The Riding Mountain Forest Reserve comprising 982,400 acres, the Duck Mountain (No. 1) Forest Reserve, comprising 987,680 acres, and the Porcupine (No. 1) Forest Reserve, comprising 759,040 acres—a total of 2,729,120 acres—are tracts of land rising from 300 to 1,000 feet above the surrounding plains, and their general character is the same. The timber consists of spruce, jack pine and tamarack on the upper plateau. Poplar, with considerable white birch, covers most of the lower plateau, and there is scattered in the coulees a growth of elm, oak, ash and poplar.

These tracts form a very important watershed from which flow all the main tributaries of the Assiniboine River to the south, and also to the north and east a number of streams reaching Lakes Dauphin, Manitoba and Winnipegosis. The retention of a forest cover on these hills means much toward the regulation of the flow of these streams.

As the home of the large game animals these reserves are justly and widely celebrated, and they give opportunity to the citizens of the Province of obtaining the recreation which is so much needed in our strenuous civilization, besides bringing in a good revenue to the Province and the residents of the district.

Lumbering has been carried on in the Riding Mountains since an early day in the history of the Province, and fires following lumbering have done great injury to the timber. The cutting by the lumbermen and by the settlers has been done with the object of getting out the best timber as cheaply as possible and without considering the crop that was to follow. As a consequence much timber that might have been used was left in the woods, trees that should have been left to provide a seed supply were taken out, and much debris was left to feed and make fiercer the fires



Photo. N. M. Ross.

Typical View on Spruce Woods Forest Reserve.

Note the Sparse Growth of White Spruce. It is Country such as this that the Forestry Branch Proposes to Plant with Trees.

that followed. Fires were uncontrollable for many years and the result in the condition of the stand at the present time is apparent. Mature timber is found only in scattered islands and the remainder is covered with young growth which needs careful protection for years before it becomes useful or revenue-producing.

The Riding Mountain Reserve is a very important one, as is shown by the large demand for timber from it. In 1911-12 there were taken out under settlers' permits 3,756,613 feet of lumber, besides other products, such as posts, rails, cordwood, &c., and the yearly demand is increasing. With the exception of a few small tracts which were granted under license before the reserve was established the cutting is now all done under settlers' permits. In order to locate and control the cutting by settlers so as to get careful logging, close utilization and disposal of debris, small mills have recently been allowed in the reserves under contract to cut under the authority of settlers' permits on definite tracts. This has made an improvement in the method of operations and, if properly supervised, should result in improved methods that will perpetuate the forest.

FOREST RESERVE ADMINISTRATION.

The arrangement by which the forest reserve officers are given no authority over the cutting on timber berths in the reserves granted under license, although the licenses make provision for improved methods, leaves the best timbered areas in the reserves to be operated without any supervision to reduce the fire danger or to ensure

the reproduction of the forest. That improvement in methods should be required of settlers and small operators, while no effort is made to introduce such methods on large operations, is not only illogical, but is largely subversive of the objects for which the reserves are established, namely, the protection and reproduction of the timber of the best species in perpetuity.

The prevention of fire on the reserves is a problem similar to that of the prevention of fires in cities. The things to be provided are:

- (1) means of getting immediate information of fires;
- (2) means of reaching fires quickly;
- (3) a staff of fire-fighters;
- (4) equipment for fighting fires, and preventive measures.

Each reserve is divided into ranger districts with a forest ranger in charge. These districts now average 200 square miles and are too large. The area which one man can patrol will vary with the special danger of fire that there may be in the district and with the efficiency of the preventive measures adopted. For effective protection in any frequented district the area should not be more than 100 square miles.

To get immediate information of fires a sufficient patrol is required and this is supplemented by stationing men at elevated lookout points where a view can be obtained over large areas of forest, and by constructing telephone lines by which warning of fire may be transmitted without delay.

To provide means of reaching fires quickly roads and trails are opened up so that all parts of the reserve may be readily accessible.

To obtain fire-fighters when more than the regular staff of the reserve are required for that purpose, a populated district in the vicinity is required, with means of communication and of reaching the scene of the fire. One of the great difficulties of handling fire in the far north is that if the fire gets beyond the control of the ranger it is usually impossible to get assistance owing to the sparse population.

Equipment for fighting fires and preventive measures consist of the plowing or otherwise making of fire-guards, the locating of fire-fighting tools at convenient points, and the furnishing of easily transported tools, such as canvas water-buckets, to the rangers.

As an example, on the Riding Mountain in the past year the reserve has been divided into seven ranger districts with an area of 220 square miles on the average. One ranger house has been built, 74 miles of road, 10 miles of trail, 19.5 miles of fire-guard and 25 miles of telephone line have been constructed, so that we are working towards a proper administration and equipment. It will be seen that a large expenditure on capital account will be necessary for a number of years in order to ensure future revenue.

NORTHERN MANITOBA.

On the east side of Lake Winnipeg, rock of the Laurentian formation intrudes from northern Ontario and, skirting the lake to the north end, stretches over a great part of Northern Manitoba to Hudson Bay on the east and westward to a line running northwest from Limestone Bay on Lake Winnipeg, from which line limestone is the basic rock. With the exception of the large area of clay land on the Hudson Bay Railway route and scattered valleys and prairies of small dimensions, the remainder of this area will be valuable only for timber growing, except in so far as mineral development may occur. Unfortunately at cycles of dry seasons these northern forests have suffered greatly from fire. The present stand seems to indicate that at periods of eighty and forty years ago there were general conflagrations, that swept over immense stretches of the forest, while smaller fires have occurred at more frequent intervals. The country is, however, covered practically everywhere with a growth of trees which, while generally yet too small to be of much utility, have great promise for the future. The stand on islands and places protected from fire, of mature timber up to 24 inches in diameter, shows clearly the timber possibilities of



Typical Stand of Spruce and Jack Pine on the Edge of an old Burn (Brule) in the Riding Mountain Forest Reserve. Photo, H. R. MacMillan.



Typical Forest of Spruce and Larch (Tamarack) in Northern Manitoba. Photo, J. R. Dickson.
This View was Secured on the North Shore of Sipiwesik Lake, not far from the Proposed Route of the Hudson Bay Railway. The Figures in the Illustration Give a Good Idea of the Size of the Timber.

the region, and, with the water-powers on the rivers flowing through it, industrial development there has possibilities that cannot easily be overestimated.

WILL FORESTRY PAY?

But the question will very properly be asked: Will the return for the expenditure for protection and reproduction of the forest be adequate?

In reply let me say that the investigations we have made of the rate of growth of timber in the province of Manitoba compare favourably with the rates of growth in European countries, such as Germany, France and Sweden, where forestry is being practised profitably. The rotation, or the period required for maturing a crop of trees from seed, in Germany is with spruce and pine from 60 to 80 years. In Sweden the rotation is 60 to 80 years for pulpwood and 100 to 120 years for lumber. The investigations of rates of growth of spruce and pine so far as they have been carried out here indicate that on ordinary well drained soil the period of rotation might be within similar limits. Attached are tables showing rates of growth in the Riding Mountain Forest Reserve and also for purposes of comparison similar tables for forests in Sweden.

The annual rate of production of timber in a European forest is from 250 feet, board measure, per acre up to as high as 1,000 feet, board measure. If only a production of 100 feet, board measure, per annum were reached in the present Riding Mountain, Duck Mountain, and Porcupine Hills Reserves in Manitoba, the aggregate area of which is 2,415,840 acres, it would mean an annual cut of 241,584,000 feet, board measure, a cut equal to that of Manitoba, Saskatchewan and Alberta at the present time, and if the production were 200 feet, board measure, to the acre it would be 483,168,000 feet, board measure, which exceeds the present cut of lumber in Nova Scotia or in New Brunswick, and this includes only a portion of the old Province of Manitoba, not considering at all the new area added in the north.

MANITOBA VS. SWEDEN.

In order to make clear the case for forestry in the Province of Manitoba, I think it would be fair to make a comparison with Sweden, which is a northern country where the conditions of climate and soil are similar. Much of Sweden is underlain by a similar granitic formation to that of our Laurentian area. Sweden has made great advances in forestry in recent years.

Sweden and Manitoba may be compared as follows:—

	Sweden.	Manitoba.
Population.	5,600,000	500,000
Total Area. square miles	172,876	251,832
	acres	110,630,640
Water Area.	“ 9,056,845	12,739,600
Land Area.	“ 101,573,795	148,432,798
Agricultural Land.	“ 12,377,276	30,000,000
Forest Land.	“ 51,563,985	

In Manitoba the lumber cut for 1911 was 53,745,000 feet, board measure, which would equal 8,957,500 cubic feet, (a cubic foot is equal to about six feet board measure) and the value was \$769,806. The number of mills operating was 103.

From the forest area of Sweden the returns are as follows:—

Timber Output.	1,020,000,000	cubic feet.
Domestic Use.	560,000,000	“ “
Wood-working Industries.	54,000,000	“ “
Mining.	190,000,000	“ “
Export.	216,000,000	“ “
Total Value of Forest Products.	\$107,000,000	
Total Value of Agricultural Products.	\$214,000,000	

The 1905 figures regarding Sweden's wood-working industries are as follows:—

	Saw-mills, Pulp-mills, Match Factories.		
Number of Industries.. . . .	1,370	138	20
Number of Employees.. . . .	41,849	8,897	5,678

The statistics as to Sweden's government forests are as follows:—

Area..	(90 % of which is forested.)	21,200,457 acres
Revenue..		\$3,415,625
Expenditure..		\$1,293,000
Net Revenue..		\$2,122,625
Staff (Technical)..		230
Forest Rangers..		741
Total Staff..		971

Sweden has probably the advantage of Manitoba in having better drainage in some of the northern areas and in having a more extended sea-coast, with quicker and cheaper access to long established markets, but I cannot see that other conditions exist that give Sweden an advantage over Manitoba if the forest areas were in as good condition. This they are not at present, nor will they be for a long time to come, and it will require a large expenditure on protection and improvements without regard to revenue during that time, to bring the forests into good condition and to produce a revenue that will more than offset the expenditure. Under the administration of the federal government the forests have been allowed to get into such an unsatisfactory condition and the federal government should make the necessary expenditure from its large revenues to place such a great natural resource, and so important to the prosperity of the province and of the whole country in a condition of permanent security and producing power so that it may regularly and continuously produce a supply for the domestic needs of the population, a revenue for the State and the raw material for industries.

TABLE SHOWING COMPARATIVE GROWTH OF SPRUCE IN MANITOBA AND SWEDEN.

Age of Tree.	Riding Mountain Forest Reserve.		Sweden.
	White Spruce. (<i>Picea canadensis</i>).		'Norway' Spruce. (<i>Picea excelsa</i>).
	Height.	Diameter at Breast-height.	Diameter at Breast-height.
Years.	Feet	Inches.	Inches.
10..	2'0		1'14
20..	8'5	1'0	2'42
30..	16'5	2'4	3'31
40..	25'5	4'2	4'14
50..	35'5	6'1	4'83
60..	45'0	8'0	5'46
70..	52'5	9'6	6'08
80..	59'0	11'0	6'63
90..	64'0	12'2	7'17
100..	68'0	13'1	7'64
110..	71'0	14'0	8'15
120..	73'5	14'8	8'58
130..	75'5	15'6	9'00
140..	77'0	16'3	9'44
150..	78'0	16'8	9'83
160..			10'21
170..			10'57
180..			11'00
190..			11'27
200..			11'58

THE TREES OF MANITOBA.

CONIFERS (EVERGREENS).

WHITE SPRUCE (*Picea canadensis*).—This tree is found throughout Canada and stands in the foremost place in the production of lumber and pulp. It is found in Manitoba usually in mixture with poplar, birch, balsam fir and tamarack. In crowded stands it forms a long, clear, full trunk with short, compact crown. In 150 years on good sites it sometimes reaches a diameter of two feet and a height of ninety feet. It is very tolerant of shade and recovers readily from suppression, and this, added to the fact that it is a prolific seeder, insures its permanence as a forest type in Manitoba.

The wood is tougher and more elastic than pine and is gradually taking the place of pine for dimension timber, and being non-resinous, tasteless and odourless, is preferred for boxes and barrels for food stuffs. It is the best species for the manufacture of pulp and paper. Other uses:—railway ties, building construction, flooring, furniture, poles, posts, &c.

It is one of the most valuable timber trees of the Dominion.

BLACK SPRUCE (*Picea mariana*).—Found throughout Manitoba, it is usually confined to poorly drained areas, though sometimes mixed with the white spruce on higher ground. In its natural habitat (swamp or muskeg) it occurs in close, pure stands or in mixture with tamarack. It is a prolific seeder with excellent natural reproduction, being very tolerant of shade, but is a slow-growing tree, taking 140 years to attain a diameter of nine inches and a height of fifty feet, and seldom growing larger. It is useful mainly for pulp, for fuel and for fencing, though if it occurred of larger size it could be used for the same purposes as white spruce.

JACK PINE (*Pinus Banksiana*).—This is the pine of chief commercial importance to Manitoba, as white and red pine are found only in the southeastern corner. It is fourth in quantity cut in Manitoba, being preceded by spruce, poplar and tamarack. Jack pine is found throughout the Province on sandy soils and reaches its best development in this Province west of Lake Winnipeg, where it frequently reaches a height of from 83 to 90 feet, with 30 feet of a clear bole, but rarely exceeds 20 inches in diameter. Its best growth is made in the first 70 years. It flourishes on dry, sandy plains, coming in extensively in pure stands after fire, owing to the fact that the intense heat opens the cones and makes subsequent seeding possible. It seldom grows in a mixture because it is intolerant of shade. The best jack pine timber produces a good grade of saw and tie material. It is coming more and more into use for pulp and may be found useful for paving blocks after preservative treatment.

WHITE PINE (*Pinus strobus*) and RED PINE (*Pinus resinosa*) occur only in the southeastern corner of the Province and are consequently of only small commercial importance to the Province.

AMERICAN LARCH or TAMARACK (*Larix laricina*).—Tamarack is found throughout the greater portion of Manitoba, occurring in small pure stands of limited area, chiefly confined to peat bogs and muskegs, owing to competition with other trees. It is a slow-growing tree in such locations and is seldom over nine inches in diameter, and like jack pine, the commercially profitable rotation is about 70 years. On high ground it grows well and at a much faster rate. It is of great strength, clear length and durability, and, having little taper, it is valuable for posts, rafters, fencing and construction work generally. It is the most valued fuel-wood in Manitoba and is of great utility to the settler. It should be favoured on all poorly drained areas.

BALSAM FIR (*Abies balsamea*).—This tree occurs extensively in Manitoba and, being tolerant of shade and a prolific seeder, one of the forester's chief problems is to prevent it from driving out the more valuable spruce. The best of it is cut and mixed with spruce lumber, but it is primarily a pulpwood species and is principally cut for this purpose, the long tough, colourless fibres being valuable for paper-making. From

THE EXHIBIT OF M
WOODS AT THE CONVENTION OF THE CANADIAN FORESTRY ASSOCIATION AT WINNIPEG, MAN., JULY 5 TO 7, 1913
The Exhibit was arranged in the large rotunda of the Winnipeg Industrial Bureau. The illustrations below show the two halves of the exhibit.



Black Willow (*Salix nigra*) Dia. 29 in.

American (White) Elm (*Ulmus americana*) Dia. 20 in.

Balsam Fir (*Abies balsamea*) Dia. 24 in.

Black Spruce (*Picea mariana*) Dia. 12 in.

Aspen (White) Poplar (*Populus tremuloides*) Dia. 27 in.

Balsam (Black) Poplar or Balm of Gilead (*Populus balsamifera*) Dia. 30 in.

Cottonwood (*Populus deltoides*) Dia. 42 in.

White Cedar (*Thuja occidentalis*) Dia. 15 in.

Basswood (*Tilia americana*) Dia. 22 in.



Black Ash (*Fraxinus nigra*) Dia. 18 in.

Bur Oak (*Quercus macrocarpa*) Dia. 33 in.

White Spruce (*Picea canadensis*) Dia. 40 in.

Tamarack (*Larix laricina*) Dia. 19 in.

White Birch (*Betula alba, var. papyrifera*) Dia. 19 in.

Jack Pine (*Pinus Banksiana*) Dia. 22 in.

Red (Norway) Pine (*Pinus resinosa*) Dia. 24 in.

Manitoba Maple (*Acer Negundo*) Dia. 18 in.

the blisters on the bark is obtained the balsam used in the manufacture of compound lenses and also for medicinal purposes.

WHITE CEDAR (*Thuja occidentalis*).—This tree is found only in the southeastern portion of Manitoba and at one spot on the west of Lake Winnipeg. It is seldom cut into lumber. The wood is soft and weak, but it is the most durable of the native softwoods, and hence is highly valued for ties, poles, shingles, fence-posts and rails. Being light, durable and easy to work, it has always been a favourite material for small boats and canoes.

BROAD-LEAVED SPECIES (HARDWOODS).

ASPEN (*Populus tremuloides*).—Aspen or white poplar grows everywhere and only extremes of drought and moisture forbid its growth. Being very intolerant of shade it is found in even-aged stands, usually mixed with balsam fir, poplar, birch and spruce. Every year in June it produces a great abundance of downy, wind-blown seed, which explains why it is usually the first to seed in after fire.

In close stands it has a smooth straight bole with a small open crown, frequently attaining one foot in diameter and seventy feet in height. Being hard to float and because of its smooth bark, it costs 20% more to log it than spruce, but the lumber when seasoned is lighter and stronger than spruce. Being easily worked, it is used considerably in the manufacture of woodenware and furniture. It is excellent box and slack-cooperage material, is well suited for inside carpentry and forms a durable flooring of snowy whiteness. It is also suitable for pulp and is only second to spruce in the quantity used for that purpose. It makes good firewood, and is at present largely used for this purpose.

BALSAM POPLAR or BALM OF GILEAD (*Populus balsamifera*).—Locally this species is known as 'black poplar' and bears some resemblance to aspen, springing up with the latter on denuded areas. It is easily distinguishable by the aromatic odour of its buds and from the fact that it is generally found in moister locations than the aspen. It reaches a diameter of about ten inches in one hundred years, being similar in growth-rate to aspen. It is less subject to disease than aspen, but suffers more from other defects and the wood though somewhat stronger and tougher than aspen is unsuitable for flooring and as fuel is poor. Its chief value commercially will be for pulpwood.

COTTONWOOD (*Populus deltoides*).—This species occurs occasionally in the river bottoms of southern Manitoba, but is not commercially important.

BURR OAK (*Quercus macrocarpa*).—This tree is found throughout the greater part of southern Manitoba in thickets and open forests, reaching a diameter of twelve inches and over along the Assiniboine River. The wood is hard, heavy, tough and very durable, making ideal fence-posts, ties and piles. It is not used to any extent by manufacturers, but it might be made the basis of useful industries, as the agricultural implement and vehicle manufacturers of Manitoba import oak in large quantities.

PAPER BIRCH (*Betula alba* var. *papyrifera*).—This birch is found throughout the province in almost pure stands or mixed with white spruce and aspen. It reproduces readily by seed and by sprouts, coppice being luxuriant after fire or cutting, but it forms crooked stems. In the best sites it will attain a diameter of a foot in one hundred years. At present the best of it is cut for flooring and its principal use is for firewood. The wood is white, hard and close-grained, and is suitable for the manufacture of spools, bobbins, woodenware, furniture and interior finishing.

WHITE ELM (*Ulmus americana*).—This species is found in the river valleys of southern Manitoba, dropping out at the Red Deer River, but at its extreme limit it still remains a large and well developed tree. The wood is heavy, strong and tough, and is used for almost every purpose for which hardwood can be used. A great deal is used for slack cooperage, furniture, boxes, vehicle manufacture, flooring, blocks for tackle, etc. Its principal use locally is for flooring.



Photo. L. C. Tilt.
Stand of Jack Pine along the Dawson Road in Southeastern Manitoba.
Jack Pine occupies the sandy land in this district. The photograph was
taken in Tp. 7, Rge. 11, east of the Principal Meridian.

Basswood (*Tilia americana*).—This tree is found in southern Manitoba mostly in the river valleys, but is not found in large quantities. Its wood is white, light, soft and easily worked, and is used for manufacture of small woodenware, cheap furniture, light parts of farm implements, carriage panels, &c.

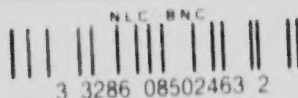
MANITOBA MAPLE or ASH-LEAVED MAPLE (*Acer Negundo*).—This tree occurs throughout the province as far north as the upper end of Lake Winnipeg. It grows very fast, but is generally crooked and is not of much value except for fuel or as a shade or decorative tree.

MOUNTAIN MAPLE (*Acer spicatum*).—This has the same range as the Manitoba maple, but never grows to sufficient size to be of much value.

BLACK ASH (*Fraxinus nigra*).—This ash occurs in swamps and river bottoms of eastern Manitoba. It can be stained to imitate plain white oak and may be used for interior finishing. Lack of taste and odour makes it useful for food-caddis, such as baskets, barrels and boxes.

RED ASH (*Fraxinus pennsylvanica*).—This tree occurs along the Assiniboine River and tributaries of Lake Winnipeg. The wood resembles that of black ash and might in time be substituted for the latter.

GREEN ASH (*Fraxinus pennsylvanica*, var. *lanceolata*).—This species is found throughout the southern part of the Province in the river valleys, but not in sufficient quantity to be of commercial importance. This is one of the best trees for planting in the shelter-belt or woodlot. Its wood resembles white ash and might be worked up locally in frame work for vehicles and as handles for agricultural implements.



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